Remarks

By this amendment, claims 1, 4, 5 and 20 have been amended and claims 25-30 have been added. The claims remaining in consideration are claims 1-30; the independent claim is claim 1.

As an aid to the Examiner, the preceding clean version of the claims shows all the claims in the application, including the claims not amended hereby.

The applicant has added new claims 25-30. Support for claim 25 is provided in the specification on page 7, line 2. The specification on page 7, line 5 provides support for claim 26. Claim 27 is supported by the specification on page 7, line 13. Support for claim 28 is provided in the specification on page 7, line 11. The specification on page 9, line 9 provides support for claim 29. Finally, claim 30 is supported by the specification on page 10, line 12. No new matter has been added by this amendment.

Claim Rejection – 35 USC §103

The Examiner has rejected claims 1-3 under 35 USC 103(a) over DE 4,327,923 in combination with Allen et al. (U.S. 4,746,551) or JP 4,320,685. Some methods to produce polyvinyl alcohol gel are known. The more recent methods have been developed by the same inventor, namely the primary inventor of the present invention, Dr. Vorlop. As described in cited document DE 43 27 923 (Vorlop and Ding) it is known to produce polyvinyl alcohol (PVA) gels by freezing and melting the PVA solution. The freeze and melt process may be repeated to enhance the mechanical stability of the gel. This method is time consuming and expensive.

One method for gelling PVA has been disclosed by the inventor in DE 43 27 923. By adding a substance comprising non aqueous OH groups, gelling of PVA is possible without freezing. However, the gelling process lasts a considerably long time, more than 10 hours. Mass production is, therefore, not possible by this method.

The present invention discloses a new mechanism for obtaining gelled PVA. The basic idea is to add a substance to the PVA solution but to choose such a substance which tends to separate from PVA by forming a separate aqueous phase.

Suitable substances are cited in the application and especially in claim 4. The substance is dissolved in the aqueous PVA solution so that a single homogeneous phase is formed. To this overall solution, the bioactive material is added. After that, the solution is concentrated by removing a part of the water content to a residual water content of typically 40%. This may be done by a heat treatment or at ambient temperature by exposing a large surface of the solution to the air so that water quickly evaporates. During the concentration process, two phases develop within the solution, namely a PVA phase and an aqueous phase for the added substance. During the process, separation water is drawn from the PVA into the separated aqueous phase whereby gelling of PVA is quickly performed. The gelled PVA is separated from the still liquid phase of the added substance and may then swell in water to enhance the water content of the PVA gel (step e). The prior art does not disclose a phase separation of a PVA solution in order to get the gelled PVA solution.

Moreover, the method according to the present invention allows the production of highly effective biocatalysts because no step of the inventive method is harmful to the bioactive material. For this reason and in order to clearly distinguish the present invention from JP 07 216101 as recited in the International Search Report, the present invention is restricted to the production of a biocatalyst.

For a *prima facie* case of obviousness, the prior art references must teach or suggest all of the claim limitations. As noted above, the prior art does not teach or suggest a phase separation of a PVA solution in order to get the gelled PVA solution as provided in claim 1. Thus, claim 1 must be viewed as patentable. Dependent claims 2-30 are deemed patentable for the same reasons, and additionally set out further structural and functional differences over the prior art.

In view of the above, it is submitted that this application is now in condition for allowance, and an early notice of allowance is solicited.

Respectfully submitted,

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Version With Markings to Show Changes Made

Following is a marked-up version of the claims with all changes shown by conventional comparison (underlining and bracketing):

In the Claims

1. (Amended) A process for producing a [polyvinyl alcohol gel] bio-catalyst, comprising the following steps:

a) utilizing an aqueous polyvinyl alcohol solution with a degree of hydrolysis of at least 98 mol%.;

b) dissolving an additive in the aqueous polyvinyl alcohol solution which, if the overall solution is concentrated, forms a finely distributed aqueous phase separated from the polyvinyl alcohol solution;

c) adding a biologically active material selected from the group consisting of microorganisms, enzymes, spores, and cells;

d) dehydrating the [aqueous] overall solution up to a maximum residual water content [up to] of 50 wt.% in order to cause the phases to separate and the polyvinyl alcohol to gel [with the additive forming a separate, distributed and aqueous phase] ; and

[d)] e) rehydrating the polyvinyl alcohol, including the biologically active material, in an aqueous medium.

3 4. (Amended) The process according to Claim 1, wherein the additive is used which has an affinity to water at least similar to that of the polyvinyl alcohol [or greater].

4 5. (Amended) The process according to Claim 4, wherein the additive is selected from the group consisting of cellulose esters, cellulose ethers, starch esters, starch ethers, polyalkylene glycol ethers, polyalkylene glycols, long-chain alkanoles ($n \geq 8$), sugar esters and sugar ethers.

20. (Amended) The process according to Claim [1] 19, further [includes] including the step of adding a biologically [, chemically or physically] active material.

25. (New) A mechanically highly stable bio-catalyst of polyvinyl alcohol produced according to the process set forth in Claim 1.

26. (New) A bio-catalyst according to Claim 25, produced in a lenticular form in which the diameter is significantly greater than the height.

27. (New) A bio-catalyst according to Claim 25, having a magnetic additive.

28. (New) A process for producing a product created by transformation with a bio-catalyst according to Claim 25.

29. (New) A process according to Claim 28 for producing 1,3-propane diol.

30. (New) A process according to Claim 29 for producing itaconic acid.